

Remarks

Claims 1, 10-13, 15, 16 and 21-28 are pending in the application.

Claims 1, 10-13, 15-16, 21, 24-25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Atia et al. ("Demonstration of Return-to-Zero Signalling ...", IEEE Lasers and Electro-Optics Society, 12th Annual Meeting, 8-11 Nov. 1999), hereinafter "Atia" in view of Clausen et al. (U.S. Patent No. 6,832,050 B1), hereinafter "Clausen," and Fukuchi (U.S. Patent 5,745,613), hereinafter Fukuchi.

Claims 22-23 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Atia, Clausen and Fukuchi as applied to claims 1, 10-13, 15-16, 21, 24-25 and 28 and further in view of Doran et al. (U.S. Patent No. 7,352,970 B2), hereinafter Doran.

Each of the various rejections and objections are overcome by various amendments and arguments that are presented.

Entry of this Amendment is proper under 37 CFR 1.116 since the amendment: (a) places the application in condition for allowance for the reasons discussed herein; (b) does not raise any new issue requiring further search and/or consideration since the amendments amplify issues previously discussed throughout prosecution; (c) satisfies a requirement of form asserted in the previous Office Action; (d) does not present any additional claims without canceling a corresponding number of finally rejected claims; or (e) places the application in better form for appeal, should an appeal be necessary. The amendment is necessary and was not earlier presented because it is made in response to arguments raised in the final rejection. Entry of the amendment is thus respectfully requested.

Any amendments to any claim for reasons other than as expressly recited herein as being for the purpose of distinguishing such claim from known prior art are not being made with an intent to change in any way the literal scope of such claims or the range of equivalents for such claims. They are being made simply to present language that is better in conformance with the form requirements of Title 35 of the United States Code or is simply clearer and easier to understand than the originally presented language. Any amendments to any claim expressly made in order to distinguish such claim from known

prior art are being made only with an intent to change the literal scope of such claim in the most minimal way, i.e., to just avoid the prior art in a way that leaves the claim novel and not obvious in view of the cited prior art, and no equivalent of any subject matter remaining in the claim is intended to be surrendered.

Also, since a dependent claim inherently includes the recitations of the claim or chain of claims from which it depends, it is submitted that the scope and content of any dependent claims that have been herein rewritten in independent form is exactly the same as the scope and content of those claims prior to having been rewritten in independent form. That is, although by convention such rewritten claims are labeled herein as having been "amended," it is submitted that only the format, and not the content, of these claims has been changed. This is true whether a dependent claim has been rewritten to expressly include the limitations of those claims on which it formerly depended or whether an independent claim has been rewriting to include the limitations of claims that previously depended from it. Thus, by such rewriting no equivalent of any subject matter of the original dependent claim is intended to be surrendered. If the Examiner is of a different view, he is respectfully requested to so indicate.

Rejection Under 35 U.S.C. 103(a)

Claims 1, 10-13, 15-16, 21, 24-25 and 28

Claims 1, 10-13, 15-16, 21, 24-25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Atia in view of Clausen and Fukuchi. The rejection is traversed.

The Office Action asserts that Atia teaches an apparatus including a phase modulator for modulating the optical phase of pulses within a sequence of return-to-zero pulses. (See Office Action p. 2). The Office Action asserts that Clausen teaches a system with dispersion compensating devices and teaches the advantage of using a short duty-cycle. (See Office Action p. 2-3). The Office Action further asserts that Fukuchi teaches wavelength division multiplexing and concludes that the combined teachings of Atia, Clausen and Fukuchi render claim 1 obvious. (See Office Action p. 3). Applicants respectfully disagree.

In the Office Action, the Examiner dismisses portions of Applicants' prior response as mere statement or argument by the Applicants' attorney. (See Office Action p. 6). Applicants respectfully submit that such treatment by the Examiner is erroneous because Applicants' arguments were not the words of counsel, but were based upon quotations direct from the Applicants' specification which is sworn to by the Inventors/Applicants. Thus, to the extent that the Final Office action is based upon non-consideration of Applicants' previous arguments, Applicants urge the Examiner to consider the following discussion on the merits.

To support a prima facie obviousness rejection under 35 U.S.C. §103, "the prior art can be modified or combined as long as there is a reasonable expectation of success." MPEP 2143.02(I). However, there is no predictability of success when transitioning from an optical single channel application to an optical WDM system. (See Applicants' Specification, p. 1-2, Background of the Invention). For example, as stated in Applicant's Specification:

While various techniques have been attempted to reduce or eliminate the effects of noise and fiber nonlinearity, these techniques have had varying degrees of success. Some techniques have proven useful in single wavelength channel systems, but do not work well in the context of WDM systems, in which many different wavelengths are combined in a single optical transmission medium.

Use of high bit rates in conjunction with long haul and ultra-long haul (ULH) transmission, particularly in the environment in which multiple channels are combined in a WDM or DWDM system, has been additionally difficult, due to both the worsened nonlinear impairments and the increased amplifier spontaneous emission (ASE) noise, which leads to degradation of pulses as they propagate through an optical fiber path from a transmitter to a receiver and various undesirable inter-channel effects, such as inter-channel XPM and FWM.

(Spec. p. 1-2, Background of the Invention) (emphasis added). See MPEP 2143.02 "Reasonable Expectation of Success is Required." Thus, in a WDM application additional transmission penalties, for example, inter-channel XPM and FWM are relevant. Success in a single channel application is no predictor of whether a similar WDM system will also be successful.

As discussed in Applicants' prior response, Atia only teaches single channel return-to-zero (RZ) carrier pulses modulated by on-off keying (OOK) or differential phase shift keying (DPSK) to improve receiver sensitivity in an optically preamplified receiver. Atia does not teach or suggest that RZ-DPSK signals are combined in WDM format for long haul wavelength division multiplexed (WDM) transmission. Thus, Atia also does not teach or disclose that the use of RZ-DPSK or other PSK formats reduce the inter-channel four way mixing penalty (FWM) because Atia is not a WDM system.

Clausen teaches a method and system for dispersion management of RZ modulated pulses by means of "tedon" transmission whereby RZ pulses are propagated with a short duty cycle, the short duty cycle purposely designed to cause the pulses to spread as far apart as quickly as possible. Pre-dispersion compensation is provided by the introduction of pre-chirp. (Clausen col. 3 lines 64-67). Clausen also contemplates the use of fibers with a large chromatic dispersion characteristic to facilitate greater pulse spread/dispersion. (Clausen, col. 7 lines 29-30).

Like Atia, there is no teaching or suggestion in Clausen that the apparatus or method is used in a WDM application. In fact, Clausen only suggests functionality with respect to a single channel system. For example, Clausen states at col. 7 lines 24-26: "In summary, non-linear impairments due to intrachannel interactions in schemes involving ultrashort pulse (tedon) transmission with random bit sequences have been studied" (emphasis added). Clausen also does not disclose any form of phase shift keying (PSK, DPSK, QPSK). Thus, Clausen cannot teach or suggest the advantage that DPSK or other PSK formats have in reducing the inter-channel FWM penalty in a WDM application.

While, the Office Action acknowledges that Atia and Clausen do not teach or disclose a wavelength division multiplexer/wavelength division multiplexing, it asserts that this missing feature is supplied by Fukuchi. Applicants acknowledge that Fukuchi discloses a wavelength division multiplexer and a WDM system, but strongly disagree that such disclosure may be properly combined with Atia and Clausen to render Applicants' claim 1 obvious. While Applicants agree that a wavelength division multiplexer is a common structure well known to one of ordinary skill in the art, it is not obvious to use RZ-DPSK or other RZ-phase shift keying format in a long haul or ultra

long haul WDM system where there is no predictability of success. (See MPEP 2143.02(I)). For at least this reason, the combination of Atia, Clausen and Fukuchi is not proper and therefore fails to render at least Applicants' claim 1 obvious.

Furthermore, there is no suggestion or motivation found in the prior art (Atia, Clausen, or Fukuchi) that would suggest to one of ordinary skill to combine the references in such a way so as to create the apparatus as embodied in claim 1. Fukuchi discloses WDM with non-return-to-zero (NRZ) phase encoding and, as explained in Applicants' specification, "the desire to have constant intensity in every WDM channel has lead to NRZ-DPSK [as in Fukuchi], rather than RZ-DPSK [this application]. It was not until recently did we realize that constant intensity is not necessary and that RZ-DPSK has significant advantages over NRZ-DPSK in LH and ULH transmission..." (See Applicants' Specification, p. 9, middle par.). Thus Applicants submit that Fukuchi teaches the opposite of the invention as embodied in claim 1 and would not suggest to one of ordinary skill to combine the WDM system of Fukuchi with Atia and Clausen to arrive at Applicants' claim 1. *See generally* MPEP 2143 and MPEP 2143.02. Thus, for at least this reason the combination of Atia, Clausen and Fukuchi is not proper and therefore fails to render at least Applicants' claim 1 obvious.

In addition to the foregoing, Applicants note that "[i]n determining the differences between the prior art and the claims, the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." (MPEP 2141.02 (I)). In the Office Actions, and in particular in the Final Office Action, the Examiner focuses upon the difference between the prior art and the claims. For example, at page 2 of the Final Office Action it is noted by the Examiner that "the differences between Atia et al. and the claimed invention are (a) Atia does not teach the duty cycle of the RZ pulses, (b) Atia et al. does not teach a wavelength division multiplexer, (c) Atia et al. does not teach a dispersion managed optical transmission medium." (See Office Action p. 2). With regard to the feature of a wavelength division multiplexer the Examiner asserts that "this structure is well known in the art" and "Fukuchi teaches a WDM to combine the output signal of the modulator with other modulated signals..." (See Office Action p. 3). However, the proper inquiry is not

whether a wavelength division multiplexer is obvious or well known, but whether the claimed invention as a whole would have been obvious.

As stated above, Atia and Clausen are single wavelength channel applications and do not discuss or suggest WDM. Moreover, Fukuchi teaches NRZ-DPSK, which would be the natural choice resulting from a desire to have constant intensity in every WDM channel, whereas this application teaches and claims RZ-DPSK. (See p. 9, *supra*). In view of such teachings, Applicants submit that one of ordinary skill would not be lead to create the apparatus of Applicants' independent claim 1, as a whole.

For at least the foregoing reasons, Applicants respectfully submit the Office Action fails to establish a prima facie case of obviousness with respect to Applicants' claim 1. As such, the rejection should be withdrawn.

In addition, independent claim 16 recites similar relevant features to those found in independent claim 1. For at least the same reasons as recited above with respect to claim 1, claim 16 is also patentable over the combined teaching of Atia, Clausen and Fukuchi. Finally, since claims 10-13, 15, 21, 24-25 and 28 depend from claim 1 or claim 16 and recite additional limitations therefrom, these claims are also patentable for at least the reasons discussed above with respect to claims 1 and 16.

Therefore, the rejection of claims 1, 10-13, 15-16, 21, 24-25 and 28 should be withdrawn.

Claims 22-23 and 26-27

Claims 22-23 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Atia, Clausen and Fukuchi as applied to claims 1, 10-13, 15-16, 21, 24-25 and 28 and further in view of Doran. The rejection is traversed.

Each ground of rejection applies only to dependent claims, and each is predicated on the validity of the rejection of claims 1 and 16 under 35 U.S.C. 103 over Atia, Clausen and Fukuchi. Since the rejection of claims 1 and 16 under 35 U.S.C. 103 over Atia, Clausen and Fukuchi has been overcome, as described hereinabove, and there is no argument put forth by the Office Action that Doran supplies that which is missing from

Atia, Clausen and Fukuchi to render the independent claims obvious, these grounds of rejection cannot be maintained.

Furthermore, Applicants note that Doran is only a single wavelength channel system and is therefore not concerned with inter-channel effects. (See Doran col. 2 lines 41-43 and col. 3 lines 2-7).

Therefore, the rejection of claims 22-23 and 26-27 should be withdrawn.

Conclusion

It is respectfully submitted that the Office Action's rejections have been overcome and that this application is now in condition for allowance. Reconsideration and allowance are, therefore, respectfully solicited.

If, however, the Examiner still believes that there are unresolved issues, the Examiner is invited to call Eamon Wall at (732) 842-8110 so that arrangements may be made to discuss and resolve any such issues.

Respectfully,

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